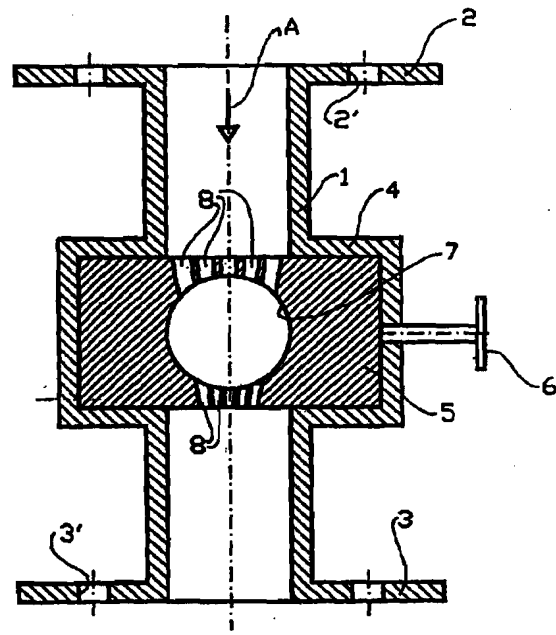




## INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

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<p>(54) Title: A DEVICE FOR THE POSITIONING OF A THROTTLE/MIXING BODY</p> <p>(57) Abstract</p> <p>The invention relates to a throttling/mixing device for mixing a fluid, especially a two- or multi-phase fluid, flowing in a pipe (1), a pipeline, a container, a tank, a separator, a heat exchanger, e.g. a discharge pipe from said separator etc., particularly, but not exclusively, in connection with fluid sampling, wherein said pipe (1) etc. comprises a valve housing (4) extending laterally of the axis of the pipe (1) etc. and projecting beyond the same at two diametrically opposite sides, and wherein the throttling/mixing device has partly a through-going passage (7), the clear width area of which corresponding to said pipe's (1) etc. fluid flow area and which can be brought to register with said fluid flow area; partly, preferably mutually sloping, but extending in the same main direction throttling channels (8) which, likewise, can be brought to register with said fluid flow area, in order to throttle/mix the fluid. In order to provide a throttling/mixing device wherein the valve housing (4) has a small extent laterally of said pipe (1) etc., maintaining a simple manoeuvring and stable mounting of the valve body (5), the throttling/mixing device has the form of a plug valve, the valve plug (5) thereof being formed with throttling channels (8) crossing the through-going passage (7) substantially right-angled at the passage's (7) longitudinal axis (1'), and that the valve plug (5) is rotatably mounted in the valve housing (4) about the common longitudinal axis thereof.</p> 		

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## A DEVICE FOR THE POSITIONING OF A THROTTLE-/MIXING BODY

This invention relates to a device for positioning a throttling and mixing body with respect to a fluid flow cross-section defined e.g. by a pipeline, possibly upstream a tank, a separator, a heat exchanger or another tubular or container-shaped equipment unit or the like, for mixing a fluid, e.g. in a two- or multi-phase stream, especially, but not exclusively, in association with sampling, wherein the throttling and mixing body in the form of a valve plug is provided with partly a group of inclined throttling channels extending in a common main direction, partly a passage, the clear width diameter of which corresponds to said fluid flow cross-section, wherein said channel group or said passage, respectively, alternately may be brought to correspond to the fluid flow cross-section, in order to throttle and mix the fluid stream through said body or to establish a free flow through said body, respectively.

Norwegian patent No. 912796 discloses an isokinetic sampling apparatus adapted to take isokinetic fluid samples during various production conditions and which is coupleable to a sampling point in a pipe, a tank, a separator, a heat exchanger, etc., wherein the fluid flows and is subjected to a considerable pressure. The present invention may be utilized in association with a sampling apparatus of this or

similar kind, but as the present invention is occupied with positioning of a mixing body, e.g. formed with a view of mixing the gas component and the liquid component of a two-phase-stream in a way that will be closer explained in the following, and said mixing body positioning not has any direct relation to said sampling, but exclusively with the mixing effect carried out, other fields of application for the present invention are thinkable, where the mixing function and the withdrawal of the mixing body for maintenance/repair/replacement not have a real association with sampling.

For such a two- or multi-phase stream mixture and sampling, very extensive sampling manifolds are previously known, comprising three valves each weighing about 500 kilos, and is supported by a fram work weighing about 1500 kilos. In one embodiment, this known sampling manifold consists of a pipe system having an upper inlet for the two- or multi-phase fluid to be tested, said upper inlet being connected to a first horizontal pipe piece in which a first hand wheel operated valve is coupled and which passes into a vertical pipe piece wherein the mixing body is securely mounted upstream a samling point. From there, a horizontal pipe portion having an inserted second valve leads to the outlet, which is connected to the inlet through a pipe portion having an inserted third valve. This known samling manifold is too comprehensive, heavy and expensive to consitute a readily portable sampling apparatus having a reasonably large field of application. The inlet of the apparatus has to be coupled to the tested pipeline axially, and in many cases this is tantamount to a situation wherein the fluid flow within the tested pipeline or the like must be brought to cessation prior to the connection and disconnection of the sampling manifold, in case this expensive known apparatus not is to be connected permanently, the fluid stream then being controlled through the apparatus periodically (each time a sampling is to take place).

British patent application No. 2,041,035 discloses methods and apparatus for sampling of the kind concerned. The samples are taken from a fluid stream passing out from a well or the like, the fluid containing gaseous and liquid components. According to this British patent application, the pipeline within which the two-phase stream passes and in which the sampling is to be carried out, is equipped with a conventional mixing body which is axially inserted into the pipeline, with all the difficulties such a positioning would involve, especially with a view to the general withdrawal possibilities of the mixing body and the potential need for maintenance and replacement.

A mixing body of the kind concerned consists conventionally of a relatively short tubular metal body having axial through-going bores which, except for a possible central bore, extend inclinedly in relation to the longitudinal axis of the tubular mixing body, so that all bores meet in an imagined "focal point". Such a mixing body wherein the axial, slopingly extending bores cause an efficient mixing of the two phases of the flowing fluid, especially within the area of said focal point, is to be placed upstream a sampling probe, and the inlet and thereof may be placed at a desired distance from said focal point.

Norwegian patent No. 174,015 discloses a device for positioning a throttling/mixing body in relation to a fluid flow cross-section, said device distinguishing itself through a valve housing adapted to be fluid-tightly coupled to the pipeline or the like mentioned introductorily, within an area of two diametrically opposite apertures, confining these, in which valve housing a sluice body is displaceably disposed, said sluice body carrying said throttling/mixing body and being displaceable between two main positions. In one of these main positions, the channels of the throttling/mixing body - which extend slopingly in relation to each other, but extend in the same main direction as the fluid stream - are brought to correspond to the fluid flow cross-section, thus

throttling and mixing the fluid. In the other main position, one passage having the same clear width as the fluid flow cross-section is brought to correspond with the latter.

This known plug valve presupposes a linear displacement of the valve plug wherein the throttling channels and the passage are formed, and this - together with the substantial extent of the valve plug where the throttling channels and the passage are placed at a distance from each other in the longitudinal direction of the valve plug - calls for a very considerable extent of the valve housing laterally of the pipeline, to which the plug valve is assigned. Often, space conditions at e.g. discharge pipes from oil-gas-separators are, however, very narrow, such that it might be difficult or impossible to insert such a plug valve.

It is an object of the present invention to remedy defects, disadvantages and limitations of application associated with prior art technique and, thus, i.a. provide a compact and constructively/functionally very simple plug valve for this purpose.

The object is realized in that the plug valve exhibits the features appearing from the characterizing part of the following claim 1.

In that the valve plug is formed with throttling channels crossing the through-going passage substantially right-angled to the longitudinal axis of the passage, a very compact valve plug is achieved, suitable for rotation between the two 90° angularly displaced main positions, wherein the throttling channels or the passage, respectively, are/is brought to register to the fluid flow cross-section in question.

Usually, the passage has a circular cross-section, corresponding to an internal cross-sectional shape of the

pipeline or the like, in which the plug valve is to be fitted.

The valve plug must, due to the rotation, have a cylindrical shape, and the plug valve housing has a corresponding, internally cylindrical shape. The gable sides of the valve plug may, thus, extend completely out to the two opposing internal end walls of the valve housing and, thus, a very stable mounting of the compact valve body is achieved.

The throttling channels slope, as known per se, in such a manner in relation to each other that the imaginary continuations of the axes thereof meet in one point.

Within the valve plug, the throttling channels in the mid-region will be interrupted by the passage extending right-angled to the longitudinal axis of the throttling channels. Fluid flowing into the throttling channels at the upstream side of the valve plug, becomes, thus, directed somewhat inwardly towards the axis of the passage, before the fluid flows into the passage, for thereafter to flow out from the throttling channels at the downstream side of the valve plug, where the already somewhat mixed fluid once more is given a directional change towards said "focal point". Such a flowing course has been found to give a very good mixing effect for two-phase fluids.

An example of a possible embodiment is further explained in the following, reference being made to the accompanying drawing, in which:

Figure 1 and 2 show axial sections through a flange pipe section provided with a lateral plug valve housing for a rotatable valve plug; and wherein:

Figure 1 shows the plug valve in the position the valve plug takes upon free through-flow of fluid through the

flange pipe section, the valve being imagined coupled into a discharge pipe from an oil-gas-separator;

Figure 2 shows the plug valve in the position the valve plug takes upon throttling/mixing of a two-phase stream through the flange pipe section.

In the drawing, reference numeral 1 denotes a flange pipe, i.e. a pipe section having a coupling flange 2, 3 at each end, and where the flanges 2, 3 have attachment holes 2' and 3', respectively. This flange pipe section is intended to be coupled into a pipeline conveying a two- or multi-phase fluid desired to be mixed, e.g. in association with sampling. The flange pipe 1 may, thus, e.g. be coupled into a gas discharge pipeline leading from an oil-gas separator, or it may be disposed in connection to a tank or heat exchanger or the like.

The flange pipe 1 has a lateral, internally cylindrically formed plug valve housing 4, within which a valve plug body 5 is rotatably mounted, a rotary handle being denoted at 6.

The valve plug body 5 is formed with a passage 7, the area of which is corresponding to the clear width of the pipe 1. In the main position for the valve plug body shown in figure 1, this passage 7 is brought to register with the pipe bore 1', and an imagined two-phase stream (confer arrow A) through the pipe 1 does not meet any resistance in this valve position.

Likewise, in the area of the passage 7, the valve plug body 5 is formed with inclined throttling channels 8, crossing the passage 7 and extending substantially right-angled to the axis thereof. As the sloping throttling channels 8 cross the passage 7, short channel portions appear both at the upstream side and downstream side of the plug valve, the passage 7 taking an intermediate position.



In accordance with the drawing, passage 7 and throttling channels 8 are formed directly in the valve plug body 5. In an alternative embodiment, not shown, passage as well as throttling channels could have been formed in special, e.g. cylindrical insert pieces, each formed with an equal passage, throttling channels varying in flow area and/or slopiness in relation to the axis direction 1' of the pipe 1, the valve plug 5 then being formed with a central core only (not shown) for the accommodation and anchoring of one of said insert pieces at a time.

The valve plug body 5 is rotated 90° from the position for free flow, figure 1, to the fluid throttling/mixing position of figure 2 by means of the rotary handle 6.

It appears from figure 2 that imagined elongation lines of the axes of the inclined channels 8 will meet in a common point, the so-called "focal point". The fact that fluid

flowing in the direction of the arrow A also will be whirled around within the passage 7 in the plug valve position of figure 2, has been found to improve the mixing effect, the quality of which is very important when sampling.

Such a plug valve may be formed very compactly, e.g. as compared with a corresponding valve according to Norwegian patent No. 174,015; the extent of the valve housing 4 at diametrically opposite sides of the pipe 1 may be restricted to correspond to an extent necessary for mounting the two end portions of the cylindrical valve plug body 5.

In the embodiment shown, the valve plug body's 5 two opposite gable faces rest against the opposing end faces of the valve housing 5, thus resulting in a very stable mounting of the valve plug body 5.

## C l a i m s

1. A throttling/mixing device for mixing a fluid, especially a two- or multi-phase fluid flowing in a pipe (1), a pipeline, a container, a tank, a separator, a heat exchanger, e.g. a discharge pipe from said separator, etc., particularly, but not exclusively, in connection with fluid sampling, wherein said pipe (1) etc. comprises a valve housing (4) extending laterally of the axis of the pipe (1) etc. and, preferably, projecting beyond the same at two diametrically opposite sides, and wherein the throttling/mixing device has partly a passage (7), the clear width area of which corresponding to the fluid flow area of said pipe (1) etc. and which can be brought to register with said fluid flow area, partly, preferably inclined, throttling channels (8) extending in the same main direction and which, likewise, can be brought to register with said fluid flow area for throttling/mixing the fluid, characterized in that the throttling/mixing device has the form of a plug valve, the valve plug (5) of which is formed with throttling channels (8) crossing the passage (7) preferably right-angledly on the longitudinal axis (1') of the passage (7), and that the valve plug (5) is rotatably mounted about the longitudinal axis thereof.

2. A throttling/mixing device as set forth in claim 1, characterized in that the valve plug (5) is connected to a centrally positioned handle (6) projecting beyond the plug valve.

3. A throttling/mixing device as set forth in claim 1 or 2, characterized in that passage (7) and throttling channels (8) are formed into a separate insert body, and that the valve plug (5) is formed with a bore or cavity for the accommodation and releasable anchoring of said insert body.

4. A throttling/mixing device as set forth in claim 1, 2 or 3, characterized in that each of the valve plug's (5) two opposite gable side faces is resting supportingly against one of the valve housing's (4) two opposing end faces, in order to stabilize the mounting of the valve plug (5) within the valve housing (4).

5. A throttling/mixing device as set forth in claim 4, characterized in that the distance between said two opposing end faces of the valve housing (4) only insignificantly exceeds the diameter of the fluid flow area of said pipe (1) etc.

6. A throttling/mixing device as set forth in any one of the preceding claims, characterized in that the interior of the valve plug (5) and of the valve housing (4) has a circular cross-section.

7. A throttling/mixing device as set forth in any one of the preceding claims, wherein the throttling channels (8) slope such in relation to each other during their extent in the same main direction that imaginary extension lines of the axes of the throttling channels (8) meet in one common point, characterized in that the throttling channels (8) are formed at both sides of the passage (7), approximately diametrically opposite each other.

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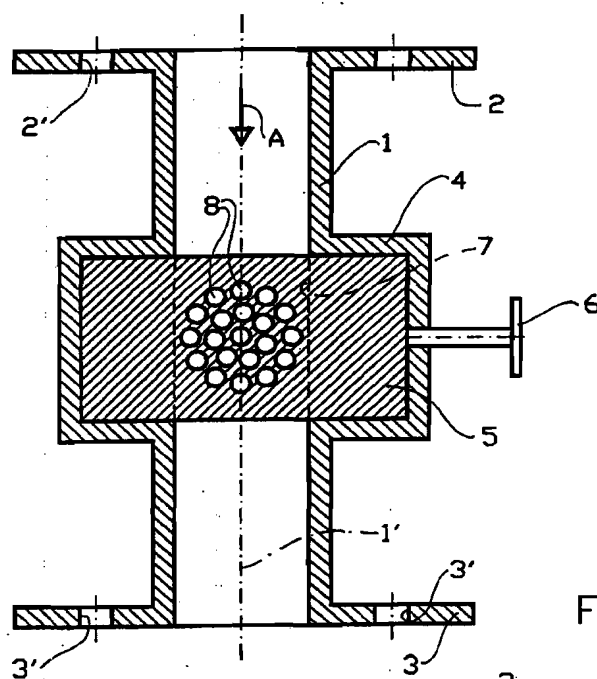


Fig. 1

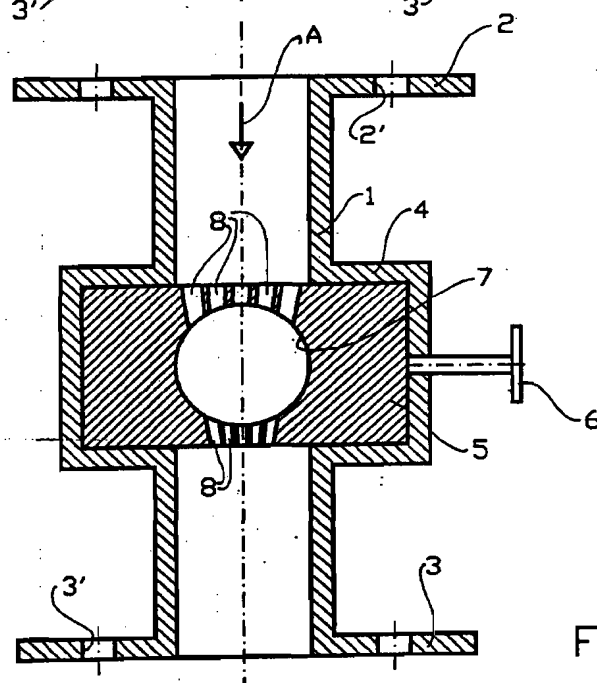


Fig. 2

## INTERNATIONAL SEARCH REPORT

International application No.

PCT/NO 95/00037

<b>A. CLASSIFICATION OF SUBJECT MATTER</b>		
IPC6: B01F 5/08 According to International Patent Classification (IPC) or to both national classification and IPC		
<b>B. FIELDS SEARCHED</b>		
Minimum documentation searched (classification system followed by classification symbols)		
IPC6: B01F, F16K		
Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched		
SE,DK,FI,NO classes as above		
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DIALOG		
<b>C. DOCUMENTS CONSIDERED TO BE RELEVANT</b>		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	NO, B, 174015 (BJORN DYBDAHL), 22 November 1993 (22.11.93), the figure and abstract  --	1-7
A	GB, A, 2041035 (SHELL INTERNATIONALE RESEARCH MAATSCHAPPIJ), 3 Sept 1980 (03.09.80), figure 2, abstract  -- -----	1-7
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**INTERNATIONAL SEARCH REPORT**  
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01/04/95

International application No.

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Patent document cited in search report	Publication date	Patent family member(s)	Publication date
NO-B- 174015	22/11/93	AU-A- 2591792	21/05/93
		GB-A- 2275990	14/09/94
		GB-D- 9407336	00/00/00
		WO-A- 9308369	29/04/93
GB-A- 2041035	03/09/80	CA-A- 1139127	11/01/83
		NL-A- 8000564	05/08/80
		US-A- 4301679	24/11/81

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